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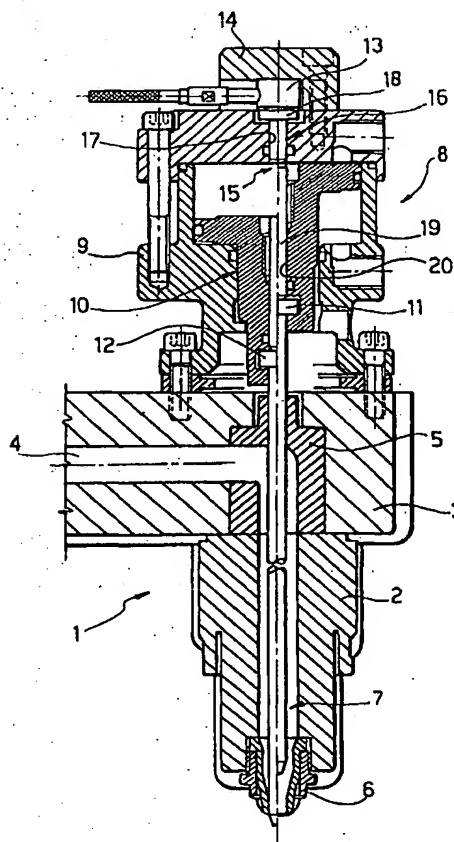
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(54) **Injector for injection moulding of plastic materials**

(57) Injector (1) for injection moulding of plastic materials, comprising a body (2, 6) and a passage for running hot plastic material into the mould, an axially mobile pin (7) in the body (2, 6) for controlling said passage and a linear actuator (8) for controlling the movement of the pin (7) between an advanced closed position of said passage and a retracted open position of said passage. The injector (1) is equipped with a pressure sensor (13) detecting the pressure inside the mould, which is operative associated to said pin (7).



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## Description

[0001] This invention relates in general to injection moulding for plastic materials and, more specifically, to an injector for injection moulding of plastic materials.

[0002] Traditionally said injectors comprise a body with a passage for running hot plastic material into the mould, a pin axially movable in the body for controlling said passage and a linear actuator for controlling displacement of the pin between an advanced closed position of said passage and a retracted open position of said passage.

[0003] In injection moulding apparatuses, a fundamental control parameter is the pressure inside the mould following injection of the plastic material. Traditionally, the pressure is directly measured in the mould, by means of specific sensors or transducers applied therein. This arrangement, in addition to not being very flexible and being relatively expensive, presents the drawback of not ensuring the required pressure measuring accuracy in all conditions.

[0004] The object of this invention is to provide a new and unique solution to overcome said drawback.

[0005] According to this invention, this object is attained by an injector for plastic material injection moulding of the type above, the primary feature of which resides in that it is provided with a sensor for measuring the pressure inside the mould which is operatively associated to said pin.

[0006] According to a preferred form of embodiment of the invention, the pressure sensor is operated by the movement of the pin to said retracted position, conveniently by means of a mobile slider arranged on the extension of said pin.

[0007] Thanks to this idea, the application of pressure sensors in the injection mould is no longer necessary. Furthermore, the arrangement according to this invention of the pressure sensor allows the application to existing injectors.

[0008] This invention will be better explained by the following detailed descriptions with reference to the accompanying figure provided as non-limiting examples, which schematically illustrates a simplified form of an axial cross-section of the injector for plastic material injection moulding according to this invention.

[0009] With reference to the figure, numeral 1 generally indicates an injector for plastic material injection moulding according to this invention, essentially consisting of a tubular body 2 applied, in the case of the illustrated embodiment, under a hot chamber 3 with a runner 4 for the plastic material melt to be injected. The runner 4 communicates with the hollow body cavity 2 through a bushing 5 in the hot chamber 3, so to direct the flow of plastic material melt to a terminal insert 6 of the injector through which the plastic material is injected inside the mould.

[0010] The passage through the insert 6 is controlled by means of an axial pin 7 which moves through the cav-

ity of the body 2 and the bushing 5 from an advanced closed position of the passage through the insert 6, shown on the left of the figure with respect to the axis of the injector, to a retracted open position of the passage through the insert 6, illustrated on the right of the figure, again with respect to the axis of the injector, as described in more detail below.

[0011] The movement of the pin 7 between the advanced position and the retracted position is controlled, in a way which is generally known, by means of a linear fluid actuator 8, comprising a cylinder 9 fastened over the hot chamber 3 and a piston 10 moving in the cylinder 9 between a lowered position, shown in the left side of the drawing with reference to the axis of the injector, corresponding to the advanced position of the pin 7, and a raised position, illustrated on the right of the drawing with reference to the axis of the injector, corresponding to the retracted position of the pin 7.

[0012] The piston 10 is connected to the pin 7 by means of an enlarged head 11 of the pin, arranged on the opposite end with respect to the insert 6, in a corresponding seat 12 formed in the lower part of the piston. A certain axial play is provided between the head 11 and the seat 12.

[0013] According to a fundamental characteristic of the invention, the injector 1 is also equipped with a pressure sensor or transducer 13 of a generally conventional type, mechanically operated by the pin 7 as described below.

[0014] The pressure sensor 13 is inserted in a casing 14 applied to the tip of the cylinder 9 of the linear actuator 8 so to be on the same axis with the pin 7. The output of the pressure sensor 13 is electrically connected, in a conventional way, to the control system of the injection moulding apparatus to which the injector 1 is associated.

[0015] A mobile slider 15, consisting of an actuating tip 16 sealingly sliding through a bore 17 in the top of the cylinder 9, with an end head 18 arranged in contact with the sensitive part of the pressure sensor 13 which opposite end faces a rod 19, is provided for operating the pressure sensor 13 by the pin 7. The rod 19 is axially interposed between the insert 16 and the end head 11 of the pin 7 and is axially slidable sealingly through a sealed cavity 20 of the piston 10.

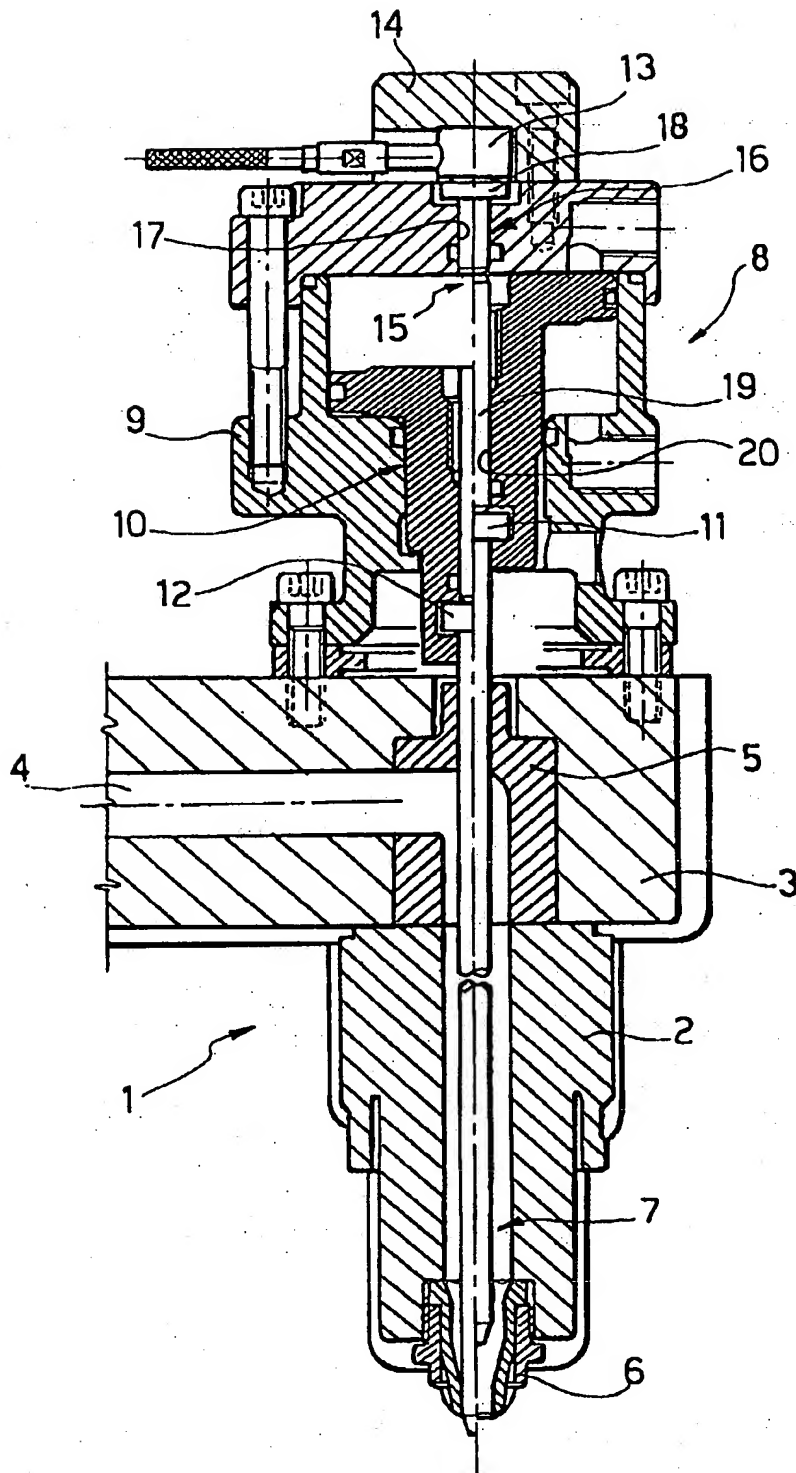
[0016] In operation, when the pin 7 is moved by the piston 10 of the linear actuator 8 from the advanced position to the retracted position, melt plastic material runs through the runner 4 of the hot chamber 3 and, consequently, through the hollow body 2 and the insert 6 in the mould cavity. The pressure of the plastic material injected in the mould applied to the end of the pin 7 facing the mould is translated into a force, indicated with letter F in the figure, tending to push the pin 7 upwards. This force is transmitted, via the head 11 and the stem 19, to the insert 16 which is pressed against the sensitive part of the pressure sensor 13 with a force which is proportional to the pressure inside the mould. This pres-

sure will be indicated by the sensor 13 with the maximum accuracy.

[0017] Naturally, numerous changes can be implemented to the construction and forms of embodiment of the invention herein envisaged, all comprised within the context of the concept characterising this invention, as defined by the following claims.

#### Claims

1. Injector for injection moulding of plastic materials, comprising a body (2, 6) and a passage for running hot plastic material into the mould, a pin (7) axially movable in the body (2, 6) for controlling said passage and a linear actuator (8) for controlling displacement of the pin (7) between an advanced closed position of said passage and a retracted open position of said passage, **characterised in that** it is equipped with a pressure sensor (13) for measuring the pressure inside the mould, said pressure sensor (13) being operatively associated to said pin (7).
2. Injector according to claim 1, **characterised in that** said pressure sensor (13) is operated by the movement of the pin (7) to said retracted position.
3. Injector according to claim 2, **characterised in that** said pressure sensor (13) is operated by a mobile slider (15) arranged on the extension of the pin (7).
4. Injector according to claim 3, in which said linear actuator is a fluid actuator (8) having a cylinder (9) and a piston (10) sealingly movable in the cylinder (9) and coaxially connected to the pin (7), **characterised in that** said piston (10) is hollow and is sealingly passed through by a rod (19) axially interposed between said pin (7) and an insert (16) operating said pressure sensor (13).



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## EUROPEAN SEARCH REPORT

Application Number

EP 01 83 0679

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			B29C
The present search report has been drawn up for all claims			
Place of search <b>MUNICH</b>		Date of completion of the search <b>16 October 2002</b>	Examiner <b>Clarke, A</b>
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ----- * : member of the same patent family, corresponding document	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT  
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